Characteristics Affecting Utilization of Dental Services in Medicaid-Enrolled Children

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Understanding why patients do or do not use their insurance benefits, particularly for preventive care, can help to improve access to care in the future. This study reports significant influences on utilization of preventive dental services benefits in children, ages 0-18, enrolled in Medicaid in 2016 in five northeastern states. OBJECTIVE: of the study was to determine the effect specific patient demographic variables (age, race, gender, eligibility) had on the utilization of preventive dental services by children enrolled in Medicaid for 2016. METHODS: A secondary analysis of data from the CMS Form 416 and the Medical Expenditure Panel Survey was performed. The significance of the association between each variable and utilization rate was tested using a chi-square test. The strength of the association within each variable was determined using the relative risk. RESULTS: showed a significant association between patient demographic variables (age, gender, race, and eligibility) and utilization ($p = <0.001$). The strength of association was most significant between males and females (RR = 1.034); between whites and blacks (RR = 0.737); between categorically and medically needy in NY (RR = 1.016) and NH (RR = 0.524); between 0-2 year olds and 6-9 year olds in PA (RR = 0.485), NY (RR = 0.485), NH (3.124), VT (RR = 4.053), and RI (RR = 2.88). The difference between eligibility and utilization in RI was not significant ($p = 0.092$). CONCLUSIONS: White patients and female patients are more likely to utilize Medicaid benefits for preventive dental services. Medically needy children are more likely to utilize Medicaid benefits for preventive dental services in NY. 0-2 year olds are more likely to utilize Medicaid benefits for preventive

dental services in NY and PA, and 6-9 year olds are more likely to utilize Medicaid benefits for preventive dental services in NH, VT, and RI.

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1.0 Literature Review

Currently, dental care utilization among children, and especially among children who live in low-income families, is well below what is recommended by the American Dental Association (ADA) and the American Academy of Pediatric Dentistry (AAPD) (Yarbrough, Nasseh, & Vujicic, 2014). A better understanding of the characteristics of those children who do not utilize dental services and the reasons for not doing so can aid in the development of effective programs aimed at those children (Bouchery, 2013).

1.1 Dental Caries in Children

Dental caries is a transmissible disease caused primarily by mutans streptococci, a tooth-adherent bacteria that metabolizes sugars to produce acid which, over time, demineralizes tooth structure (American Academy of Pediatric Dentistry, 2014). The etiology of caries is multifactorial and complex. It is closely related to multiple risk factors including past caries experience, plaque accumulation, oral hygiene, dietary habits, mental or physical disabilities, saliva quality and quantity, medications, fluoride exposure, immune system, socio economic status, and tooth morphology (Guzman-Armstrong, 2005).

There are many serious consequences that can result from untreated dental caries. They include weight loss, poor nutrition, and slow physical growth and development (Paschal, Wilroy, & Hawley, 2016; Hom, Lee, Silverman, & Casamassimo, 2013). It also has a detrimental impact on the dentition, which can lead to loss of teeth, an adverse effect on speech, and negatively affects

self-esteem and social interaction (American Academy of Pediatric Dentistry, 2014; Hom, Lee, Silverman, & Casamassimo, 2013). Further, the pain that comes from a tooth infection often leads to missed school days and poor concentration, which may result in poor school performance (American Academy of Pediatric Dentistry, 2014). In addition, untreated dental caries has been linked to ear and sinus infections, weakened immune systems, diabetes, and heart and lung disease, and potentially life-threatening infections and a diminished quality of life (American Academy of Pediatric Dentistry, 2014; Brickhouse, et al. 2008; Kaiser Commission on Medicaid & the Uninsured, 2009).

The Centers for Disease Control and Prevention reports that dental caries is the most prevalent infectious disease in children in the United States (American Academy of Pediatric Dentistry, 2014). It has also been identified as the most prevalent unmet health need. Dental caries has been identified as the most common chronic disease among American children, occurring five times more frequently than asthma, and seven times more frequently than hay fever (Brickhouse, et al., 2008).

The problems associated with dental caries are increasing, especially among pre-school aged children (Chalmers, et al., 2018). More than 40 percent of American children experience dental caries before kindergarten, and one study has estimated that, as recently as 2012, one in four American children was living with untreated tooth decay (American Academy of Pediatric Dentistry, 2014; Kaiser Commission on Medicaid & the Uninsured, 2012).

Dental caries is especially significant among children who live in low-income families. Children in those families are more likely to have dental disease than children who live in higher-income households (American Academy of Pediatric Dentistry, 2014; Hom, Lee, Silverman, & Casamassimo, 2013). Studies have found that 80 percent of dental caries is found in 20 to 25

percent of children, and these are primarily children from low-income families (Liu, et al., 2007). In addition, government reports concluded that millions of children who are enrolled in Medicaid are living with untreated tooth decay and other dental problems (Murrin, 2016). Children enrolled in Medicaid are more likely to have extensive and untreated tooth decay than children with parents who earn high incomes or otherwise can afford private insurance (Kaiser Commission on Medicaid & the Uninsured, 2009).

Caries is also more prevalent among minority children. National data support the conclusion that racial minority children are more likely to present with dental caries than non-minority children. A study by Vargas, et al. reported that in children age two through five years old, 18 percent of Caucasian children have had caries experience, but that percentage increases to 40 percent among Mexican-American children and 29 percent among African-American children. The decay was also more severe in Mexican American and African American children (Vargas, Ronzio, 2006).

These numbers, moreover, may be understating the problem. The Vargas study noted that the prevalence of early childhood caries reported by most United States (US) studies does not include non-cavitated lesions or white spot lesions. Therefore, it is expected that the true prevalence of early childhood caries is well above published estimates (Vargas, Ronzio, 2006).

Dental caries is generally a highly preventable disease through early and regular home care and professional preventive services. The AAPD has published detailed recommendations for professional pediatric dental services, including guidelines for the frequency and content of preventive visits (Hom, Lee, Silverman, & Casamassimo, 2013). These guidelines recommend that children should be seen by a dentist for dental screening as early as six months of age and no later than six months after the first tooth erupts, or 12 months of age (Brickhouse, 2008). One of

the goals of the initial visit is to identify high-risk children through caries risk assessment. Caries risk assessment allows dentists to identify parent-infant groups who are at risk for early childhood caries and would benefit from early preventive intervention (American Academy of Pediatric Dentistry, 2014).

It is generally agreed that preventing dental disease is less costly than waiting for diseases to develop and then treating them, and this is especially true among high-risk children such as those on Medicaid (Chi, et al., 2010). One study, which analyzed the experiences of North Carolina children who were enrolled in Medicaid continuously from birth to five years of age, found that average dental-related costs were less for children the earlier their first dental visit (Savage, Lee, Kotch, & Vann Jr., 2004).

Studies also suggest that delaying a child's first visit beyond 12 months, even for a short time, could have serious consequences. One study concluded that children whose first preventive dental visit occurs at age two or three years old are more likely to require later restorative and emergency dental services than children who had a preventive visit by age one. This may be the result of not only seeing the child but counseling the parents on the child's need for regular dental visits (Lee, Bouwens, Savage, & Vann, Jr., 2006). When a condition is left undiagnosed or even when treatment is delayed, a child's condition can be expected to worsen. This makes it more difficult to treat the condition, increases the cost of the treatment, and reduces the number of dental providers who are trained sufficiently to perform the necessary and complicated procedures (Vargas, Ronzio, 2006).

1.2 Medicaid and Early Periodic Screening, Diagnostic, and Treatment (EPSDT)

Medicaid is the primary source of dental insurance coverage for children who live in low-income families (Murrin, 2016). It also currently provides health insurance coverage to more than one third of all children and a larger share of the country's most vulnerable children including children living in or near poverty; infants, toddlers and preschoolers during formative early development years; children with special health care needs; and children who have suffered neglect and abuse leading to placement in foster care (Brooks, et al., 2017). The Medicaid program is a joint federal and state program (Hom, Lee, Silverman, & Casamassimo, 2013). The states administer individual programs, within federal requirements, and it is funded jointly by both the federal and state governments (Peters, 2006). The federal Medicaid statute requires states to cover children in families whose incomes are at least 138 percent of the federal poverty level (Brooks, et al., 2017). However, 49 states cover children in families with incomes up to at least 200 percent of the federal poverty level, and 19 states cover children living in families with incomes above 300 percent of the federal poverty level (Medicaid and CHIP Payment and Access Commission, 2016; Brooks, et al., 2017). The federal Medicaid statute also requires certain benefits that must be provided to all beneficiaries. Additionally, states can also elect to cover additional optional benefits and populations, and because of that, eligibility to participate in the programs varies from state to state (Peters, 2006).

The availability of Medicaid health care benefits, in general, has produced positive results. Over the long-term, Medicaid coverage has been associated with fewer chronic health conditions, better education achievement, and less reliance on other government programs (Wherry, Kenney, Sommers, 2016). The Medicaid program was started in 1965 when Congress passed Title XIX of

the Social Security Act. The original statute, however, did not include either specific standards for the coverage of children or a minimum child preventive benefit package (Peters, 2006).

In 1967, Congress enacted the Early Periodic Screening, Diagnostic, and Treatment (EPSDT) benefit within Medicaid to improve the availability and quality of pediatric health care. The purpose of EPSDT is to improve the availability and quality of pediatric health care by making Medicaid less about treating illnesses and more about providing services that will promote childhood growth and development (Peters, 2006). Under EPSDT, all states are federally mandated to cover comprehensive dental services for children younger than 21 years old (Hom, Lee, Silverman, & Casamassimo, 2013). These comprehensive benefits include diagnostic, such as radiographs and exams; preventive, such as cleanings and fluoride; and restorative dental services, such as fillings (Murrin, 2016; Centers for Medicare & Medicaid Services, 2016).

EPSDT provides greater benefits for Medicaid-enrolled children than most private health insurance packages (Johnson, 2006). EPSDT services are required even when a state's Medicaid program does not otherwise cover the services. "If a condition requiring treatment is discovered during a screening, the state must provide the necessary services to treat that condition, whether or not such services are included in the state's Medicaid plan" (Hom, Lee, Silverman, & Casamassimo, 2013).

In 1989, Congress amended EPSDT by passing the Omnibus Reconciliation Act (The Commonwealth Fund, 2005). The most significant result of that Act is that states are required to establish and maintain schedules specifying the desired frequency of medical, vision, hearing, and dental screenings. These periodicity schedules must be based on reasonable standards of professional practice (U.S. Dep't of Health & Human Services, 1996). The dental screening schedules must be a result of consultation with a recognized dental association involved in

children's health (U.S. Dep't of Health & Human Services, 1996). For example, states may elect to follow the AAPD guidelines that recommend all children be seen for an initial examination during the first year of life. The AAPD recommends that the initial screening should include a clinical oral examination and prophylaxis for the child plus dental health counseling and anticipatory guidance for the family. The child should then be seen subsequently every six months following the initial examination (U.S. Dep't of Health & Human Services, 1996). Still, there is evidence that states EPSDT dental periodicity schedules are not consistent with the AAPD's guidelines. A study by Hom et al. found that EPSDT guidelines in three states (5.9 percent) call for the first dental visit by age two, and three states (5.9 percent) recommend the first dental visit by age three (Hom, Lee, Silverman, & Casamassimo, 2013).

EPSDT is intended to promote both access to care and utilization of the care that is available. States promote access to care by assuring that health care providers are available and accessible. Specifically, that includes recruiting physicians, dentists, and other providers to participate in EPSDT and assure that these providers perform the medical and dental examinations, diagnoses, and treatments (U.S. Dep't of Health & Human Services, 1996).

Educating families is as much an important part of the EPSDT program as the treatment services. States must promote utilization by locating eligible families and educating them about EPSDT (U.S. Dep't of Health & Human Services, 1996). Providers must also educate parents about dental development changes expected to occur between their children's dental visits. Similar to well-child medical visits, "one of the cornerstones of the infant dental visit is to prepare parents and caregivers for future age-specific needs and dental milestones" (Lee, Bouwens, Savage, & Vann, Jr., 2006).

1.3 Utilization of Dental Care Services Among Medicaid-Enrolled Children

1.3.1 Age

Whether a child is more or less likely to utilize dental services is explained in large part by the child's age. The utilization of preventive and diagnostic dental services by children up to the age of two years old is significantly lower than utilization is for any other age group, with children less than one year of age representing the age with the lowest utilization (Bouchery, 2013; Chalmers, et al., 2018). The frequency of dental visits increases substantially in children ages three through five years old (Chalmers, et al., 2018; Hakim, Babish, & Davis, 2012). As children near school age, the prevalence increases, peaking at ages six through nine years old, and drops off after that (Hakim, Babish, & Davis, 2012). One study found that, among Medicaid-enrolled children ages one through two years old, only nine percent used a preventive dental service and only two percent had received a dental treatment service. The percentages for children ages three through five years old were 38 percent for preventive services and 16 percent for treatment, and for children ages six through nine years old, the percentages were 44 for preventive services and 27 for treatment (American Academy of Pediatric Dentistry, 2014). Studies have also concluded that children ages six through nine years old are more likely to have dental care visits than any other age (Hakim, Babish, & Davis, 2012).

1.3.2 Ethnicity

A noticeable relationship between a child's race and whether or not that child received dental treatment exists. Several studies have concluded that African American and Mexican

American children are more likely than Caucasian children to be affected by dental caries and untreated tooth decay (Vargas & Ronzio, 2006; Dye, et al., 2007; ADA Health Policy Institute, 2017). According to the Surgeon General, among children between the ages of two through nine years old in families whose incomes were below the federal poverty level, 70.5 percent of Mexican American children and 67.4 percent of African American children were living with untreated tooth decay. On average, those Mexican American children had 2.4 decayed or filled teeth, while for African Americans it was 1.5 and for Caucasians it was 1.0 (U.S. Dep't of Health & Human Services, 2000).

Despite this, racial minority children are less likely to have any dental care. A study of pre-school age children in North Carolina found that, overall, the utilization of dental services by minority children is less than Caucasian children. The study attributed this to a lack of transportation, a limited number of available appointments, and a desire to see a dentist of the same race (Savage, Lee, Kotch, & Vann Jr., 2004). A comprehensive study of Medicaid enrolled children in California found that Mexican American children and African American children were less likely than Caucasian children to have had a dental visit in the preceding six months. It was suggested that the primary explanation for this was the small number of participating dentists (Pourat, & Finocchio, 2010). The Kaiser Commission on Medicaid and the Uninsured also reported that African American and Mexican American children were less likely than Caucasian children to have had a dental visit in the last year (Kaiser Commission on Medicaid & the Uninsured, 2009).

Hakim et al. compared utilization data among children of different races on both the state and national level. The study also found similar results at the state level. For example, in Alaska, African Americans were three times less likely than Caucasians to have had any dental care from

2002-2007. During the same time period, Mexican American children in Oregon were 2.6 times less likely than Caucasians to have had a dental care visit. However, the study found that, on the national level, there were few differences in the frequency of dental care visits among the races (Hakim, Babish, & Davis, 2012).

1.3.3 Gender

Gender differences in the utilization of dental services has received little attention by researchers, and what research has been done is inconclusive. Some studies have shown that utilization rates are higher for males than females. Data analyzed by Dye et al. showed that, from 2011-2014, both dental caries and untreated dental caries occurred more frequently among males than females in age groups two through five and six through eight (Dye, Mitnik, Iafolla, & Vargas, 2017). Still, other research has concluded that utilization between males and females was equal. Even though gender differences were not the primary objective of the study, Bouchery showed it did uncover data showing that the utilization of dental services was nearly equal between women and men. In the eight states that were the subject of that study, 33 percent of the male children and 35 percent of the female children received preventive services, and 19 percent of the male children and 20 percent of the female children received treatment services (Bouchery, 2013).

1.3.4 Children with Special Health Care Needs

Children with special health care needs can be defined as “those who have (or who are at risk for) a chronic physical developmental, behavioral or emotional condition and who also require health and related services of a type or amount beyond that required by children generally.” Dental

care is the most frequently cited unmet health need for these children (Lewis, 2009). Studies show that children with special health care needs, especially children with an intellectual or developmental disability, are more likely to experience dental caries, have unmet dental care needs, and overall, suffer worse oral health than children without special needs (Lewis, 2009; Chi, Momany, Jones, & Damiano, 2011). In addition, evidence shows that special needs children from low income families have a greater probability that they will have unmet dental needs. This is also true for special needs children who are more severely affected by their condition (Lewis, 2009).

Studies analyzing whether children with special health care needs are more or less likely to utilize dental services have produced mixed results. Some studies have found that children with special health care needs are more likely to have utilized dental services than children with no special health care needs. A study completed by the Medicaid and CHIP payment and access commission analyzed data from both the National Health Interview Survey (2007-2014) and the Medicare Expenditure Panel Survey (2007-2013). It concluded that children with special health care needs were more likely than children without special health care needs to have a dental visit in the past 12 months (Medicaid and CHIP Payment and Access Commission, 2016). A second study also found that children with special health care needs had more preventive dental visits and more non-preventive dental visits than children without special needs (Logan, et al. 2014).

Other studies have found that any differences in preventive dental treatment utilization were not significant. One study determined, by surveying 750 parents of special needs children in each state, that rates of preventive dental care use were relatively equal between children with and without special needs (Chi, Momany, Jones, & Damiano, 2011). A study of Iowa Medicaid dental claims for children ages three through 17 also revealed no statistically significant difference in the

receipt of preventive dental care by children with and without intellectual and/or developmental disabilities (Lewis, 2009).

Yet several other studies have found that children with special needs use dental services less than children without special needs. Paschal reported that 78 percent of children with special health care needs had not received dental care in the preceding 12 months, and of those who had, ten percent had not received all of the care that they needed. In addition, the same study found that unmet dental care needs were higher for children with special needs than in the general population of children, and that the West region of the country, followed by the South, had the highest percentage of unmet dental care needs among children with special needs (Paschal, Wilroy, & Hawley, 2016). A study of Iowa children ages three through eight years old who were newly enrolled in Medicaid concluded that those without an intellectual or development disability had their first dental visit sooner after enrollment than children with such a disability (Chi, Momany, Jones, & Damiano, 2011). Finally, the Bouchery study of nine states found that children whose enrollment in Medicaid was based on disability were less likely to receive dental treatment services than children enrolled in Medicaid based on their family's income (Bouchery, 2013).

2.0 Purpose

The purpose of this study was to evaluate the extent to which the utilization of preventive dental services by children enrolled in Medicaid for 2016 is affected by specific variables relating to patient demographics. The variables analyzed include patient age, gender, race, and basis of patient eligibility (whether the child is eligible based on categorical or medical need). Based on the literature, it is hypothesized that the six to nine year old age group will have a higher utilization rate compared to other age groups. Regarding race, it is hypothesized that Caucasian patients will have higher utilization compared to other races. It is also hypothesized that females will have a higher rate of utilization compared to males. Literature also supports the hypothesis that children eligible for Medicaid based on medical need will have a lower utilization rate than those eligible based on categorical need.

3.0 Materials and Methods

3.1 Sources of Data

This study is a secondary analysis of data that was obtained from two primary sources. The first source of the data for this study comes from the CMS Form 416. The CMS Form 416 is a questionnaire that each state submits annually to the Centers for Medicare and Medicaid Services (CMS). CMS collects data regarding the use of health care services provided under the Early Periodic Screening, Diagnostic, and Treatment program to eligible children under the age of 21. Each state submits data for all children enrolled in that state's Medicaid program, including data related to the utilization of preventive dental services (CMS, 2011b). The information provided on the CMS Form 416 reports is used to evaluate the effectiveness of EPSDT programs in each state. The data is also used to make decisions and recommendations that maximize opportunities for eligible children to receive the best possible health care. The information is also used to respond to congressional and public inquiries.

The variables examined in this study from the CMS data are age and basis of eligibility (whether the child is considered categorically or medically needy). The data from CMS Form 416 is reported for each individual state, as well as nationally for 2016. This study analyzes data from the states in the Northeast region of the United States, as determined by the US Census Bureau. Currently, each state has the option to provide EPSDT services for medically needy children, but it is not required. Because one aim of this study is to determine what effect the medically needy category has on utilization of preventive services, only the states within the Northeast region that provide EPSDT services for that category were included. The states that were examined included

Pennsylvania, New York, New Hampshire, Rhode Island, and Vermont. Although CMS collects data for those persons up through the age of 21, this study analyzes the utilization of services for the 3,713,530 children through age 18. That restriction eliminates young adults from the analysis and confines the study to children and adolescents. Only children who were enrolled in Medicaid for at least 90 continuous days are included in this study. This is because states are only required to report to CMS children who are enrolled continuously for at least 90 days. In addition, it is likely that children would have a limited opportunity to utilize services if they are only enrolled for a short period of time.

The second source of the data for this study comes from the federal government's Medical Expenditure Panel Survey (MEPS). The Medical Expenditure Panel Survey is a set of surveys of families and individuals, their medical providers, and employers throughout the United States. There are several components to the MEPS, including the Household Component, which is a nationally representative survey of the civilian population in the United States. The sample is taken from individual household members responses to the National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics. The MEPS Household Component (MEPS-HC) fields nationally representative data on demographic characteristics, access to care, use of health care services, insurance coverage, and quality of care (https://meps.ahrq.gov/mepstrends/home/index.html). The variables analyzed from the MEPS-HC for this study are patient race and gender. Because the MEPS data is not separated by each state, the data is analyzed nationally for 2016. The 66,415 patients analyzed using MEPS data also range from birth through 18 years old.

3.2 Statistical Analysis

Chi-square tests were performed to determine the association between patient age, race, gender, basis of eligibility (categorically/medically needy), and the utilization of preventive dental services. The relative risk was then calculated to determine the strength of association between each variable and the utilization rate. The study protocol was approved by the University of Pittsburgh IRB and all statistical analyses were performed using STATA (StataCorp, College Station, TX). A p value of less than 0.05 was considered statistically significant. If the confidence interval included one, the association was not statistically significant.

4.0 Results

4.1 Age

The association between patient age and utilization was analyzed by state. For each of the five states, the association between the two variables was statistically significant ($p<0.001$). Ages birth through 18 years old were divided into five groups: birth through two, three through five, six through nine, 10-14, and 15-18. To determine the strength of the association, each age group was compared to the birth through two age group. The utilization percentage for each state and each age group is presented in Table 1. The relative risk and 95% confidence interval for each state and each age group is presented in Table 2. In Pennsylvania, the age group with the largest percentage of utilization was the birth through two year old age group (85.8%). The second largest group was the 15-18 year old age group, with only 58.6%. The six through nine year old age group is 51.5% less likely to receive preventive treatment than the birth through two year old age group. Similarly, the three through five year old age group is 44.3% less likely, the 10-14 year old age group is 44.8% less likely, and the 15-18 year old age group is only 30.9% less likely to receive treatment. Each of these associations is statistically significant based on the confidence interval. In New York, the birth through two year old age group also had the largest percentage of utilization (90.2%). Similar to Pennsylvania, the six through nine year old age group is 51.5% less likely to utilize treatment. The three through five year old age group is 41.3% less likely, and the 10-14 year old age group is 47% less likely. The 15-18 year old age group is also most similar to the birth through two year old age group and is only 35% less likely to utilize treatment benefits. All of these associations are statistically significant, as determined by the confidence interval. In New

Hampshire, the group with the largest utilization rate is the six through nine year old age group (65.9%). The birth through two year old age group had the smallest utilization rate (21.1%). The six through nine year old group was 3.12 times more likely to receive treatment compared to the birth through two year old group. The 10-14 year old group was 3.00 times more likely, the three through five year old group was 2.7 times more likely, and the 15-18 year old group was 2.57 times more likely than the birth through two year old group to receive treatment. Each of these associations was clinically significant based on the confidence interval. Similar to New Hampshire, in Rhode Island the birth through two year old age group had the smallest utilization rate (21.2%) and the six through nine year old group had the largest (59.9%). Each age group was more likely to receive treatment compared to the birth through two year old group. The three through five year old group was 2.39 times more likely, the six through nine year old group was 2.82 times more likely, the 10-14 year old age group was 2.68 times more likely, and the 15-18 year old group was 1.96 times more likely. All of these associations are clinically significant, as determined by the confidence interval. In Vermont, the group with the smallest utilization rate was also the birth through two year old group (16.4%). The largest utilization rate was the six through nine year old group (66.3%). When calculating the strength of association, the six through nine year old age group was 4.05 times more likely to utilize preventive treatment than the birth through two year old group. Similarly, the three through five year old group was 3.4 times more likely, the 10-14 year old group was 3.87 times more likely, and the 15-18 year old group was 3.22 times more likely to receive treatment. Each of these associations are clinically significant based on the calculated confidence intervals.

Table 1. Utilization Rate by State, Age Group, and Treatment Category

State	Age Group	Treatment	No Treatment
PA (n=1,116,553)	0-2 (n=182,962)	84.8%	15.2%
	3-5 (n=192,269)	47.2%	52.8%
	6-9 (n=252,634)	41.1%	58.9%
	10-14 (n=282,447)	46.8%	53.2%
	15-18 (n=206,241)	58.6%	41.4%
NY (n=2,304,148)	0-2 (n=454,588)	90.2%	9.8%
	3-5 (n=380,367)	52.95%	47.05%
	6-9 (n=499,041)	43.8%	56.2%
	10-14 (n=551,158)	47.8%	52.2%
	15-18 (n=418,994)	58.6%	41.4%
NH (n=102,612)	0-2 (n=15,443)	21.1%	78.9%
	3-5 (n=17,210)	57%	43%
	6-9 (n=23,308)	65.9%	34.1%
	10-14 (n=26,809)	63.3%	36.7%
	15-18 (n=19,842)	54.3%	45.7%
VT (n=73,713)	0-2 (n=10,339)	16.35%	83.65%
	3-5 (n=12,177)	55.5%	44.5%
	6-9 (n=16,666)	66.25%	33.75%
	10-14 (n=19,600)	63.3%	36.7%
	15-18 (n=14,931)	52.65%	47.35%
RI (n=116,504)	0-2 (n=18,297)	21.2%	78.8%
	3-5 (n=19,021)	50.8%	49.2%
	6-9 (n=26,155)	59.85%	40.15%
	10-14 (n=30,203)	56.86%	43.14%
	15-18 (n=22,828)	41.65%	58.35%

Table 2. Descriptive Statistics of Utilization by State and Age Group

State	Age Group	P value	Relative Risk	95% Confidence Interval
PA (n=1,116,553)	0-2 (n=182,962)	<0.001	1	
	3-5 (n=192,269)		0.557	0.554:0.56
	6-9 (n=252,634)		0.485	0.483:0.488
	10-14 (n=282,447)		0.553	0.55:0.555
	15-18 (n=206,241)		0.691	0.689:0.694
NY (n=2,304,148)	0-2 (n=454,588)	<0.001	1	
	3-5 (n=380,367)		0.587	0.584:0.589
	6-9 (n=499,041)		0.485	0.484:0.487
	10-14 (n=551,158)		0.53	0.529:0.532
	15-18 (n=418,994)		0.65	0.648:0.651
NH (n=102,612)	0-2 (n=15,443)	<0.001	1	
	3-5 (n=17,210)		2.702	2.614:2.794
	6-9 (n=23,308)		3.124	3.026:3.227
	10-14 (n=26,809)		3.0	2.906:3.097
	15-18 (n=19,842)		2.574	2.49:2.66
VT (n=73,713)	0-2 (n=10,339)	<0.001	1	
	3-5 (n=12,177)		3.395	3.241:3.557
	6-9 (n=16,666)		4.053	3.875:4.239
	10-14 (n=19,600)		3.874	3.704:4.052
	15-18 (n=14,931)		3.221	3.076:3.373
RI (n=116,504)	0-2 (n=18,297)	<0.001	1	
	3-5 (n=19,021)		2.394	2.321:2.47
	6-9 (n=26,155)		2.8821	2.739:2.906
	10-14 (n=30,203)		2.68	2.601:2.765
	15-18 (n=22,828)		1.963	1.902:2.027

4.2 Eligibility

The association between eligibility (categorically needy or medically needy) and utilization was analyzed by state. Using a chi-square test, the association between the two variables is statistically significant ($p<0.001$) in four states (PA, NY, NH, VT). The chi-square and relative risk calculations for each state are presented in Table 3. In Pennsylvania, 46% of CN children utilized preventive treatment services compared to only 40.1% of MN children. The utilization percentages for each state are presented in Table 4. When calculating the strength of the association, MN children were 0.88 times as likely to receive treatment compared to CN children. The association is statistically significant using the confidence interval (CI = .859:.909). In New York, 42.1% of MN children received treatment compared to 41.4% of CN children. The strength of the association is statistically significant (CI = 1.01:1.02), and MN children are 1.02 times more likely to utilize treatment than CN children. In New Hampshire, 54.7% of CN children received treatment, compared to only 28.7% of MN children. Calculating relative risk, CN children are 47.6% more likely to utilize their preventive treatment benefit than MN children. The strength of association is statistically significant, with a confidence interval of (.39:.706). In Vermont, 54% of CN children utilized treatment, compared to only 41% of MN children. By calculating the relative risk, the strength of association is statistically significant (CI = .686:.838). MN children are 24.2% less likely to receive treatment than CN children (rr = .758). In Rhode Island, 48% of CN children received treatment, where as only 30.4% of MN children did. Using chi-square, unlike the other four states, the association between eligibility and utilization is not statistically significant ($p = 0.092$).

Table 3. Utilization by State, Eligibility, and Treatment Category

State	Eligibility	Treatment	No Treatment
PA (n=1,116,553)	CN (n=1,109,519)	46.03%	53.97%
	MN (n=7,034)	40.7%	59.3%
NY (n=2,304,148)	CN (n=770,832)	41.4%	58.6%
	MN (n=1,533,316)	42.1%	57.9%
NH (n=102,642)	CN (n=102,534)	54.7%	45.3%
	MN (n=108)	28.7%	71.3%
RI (n=116,504)	CN (n=116,481)	47.97%	52.03%
	MN (n=23)	30.43%	69.57%
VT (n=73,713)	CN (n=73,159)	54.04%	45.96%
	MN (n=554)	40.97%	59.03%

Table 4. Descriptive Statistics of Utilization by State and Eligibility

State	P Value	Relative Risk	95% Confidence Interval
PA (n=1,116,553)	<0.001	0.884	0.859:0.909
NY (n=2,304,148)	<0.001	1.016	1.013:1.012
NH (n=102,642)	<0.001	0.524	0.390:0.706
RI (n=116,504)	0.092	0.634	0.342:1.177
VT (n=73,713)	<0.001	0.758	0.686:0.838

4.3 Race

The largest percentage of children utilizing preventive dental treatment was seen in white children with 59.8% receiving treatment, and the lowest percentage was seen in the black population with only 44.1% receiving treatment. The black population was the only one of the five races evaluated where the percentage of children who did not receive treatment was greater than those that did (Table 5).

Table 5. Utilization by Race and Treatment Category

Race	Treatment	No Treatment
White (n=32,872)	59.8%	40.2%
Hispanic (n=16,539)	50.75%	49.25%
Black (n=9,240)	44.1%	55.9%
American Indian (n=4,410)	52.6%	47.4%
Asian (n=3,354)	53.8%	46.2%

A chi-square test found that there was a statistically significant association between race and utilization ($p<.001$). The relative risk of each race compared to white children was calculated. Hispanic children are 0.85 times as likely to utilize preventive treatment compared to white children. The strength of association is statistically significant based on the confidence interval (0.834:0.863). White children are 26% more likely to receive treatment compared to black children, and the strength of association is statistically significant (rr = 0.737; CI = 0.719:0.756). Children from the American Indian population are 0.88 times as likely as white children to utilize preventive services. The strength of association between these two races is also statistically significant (CI = 0.854:0.905). The strength of association between Asian and white children is

statistically significant (CI = 0.87:0.93), and Asian children are 10% less likely to receive preventive treatment than white children. Overall, white children are more likely to receive preventive dental treatment than other races (Table 6).

Table 6. Descriptive Statistices of Utilization by Race

Race	P value	Relative Risk	95% Confidence Interval
White (n=32,872)		1	
Hispanic (n=16,539)	<0.001	0.848	0.834:0.863
Black (n=9,240)	<0.001	0.737	0.719:0.755
American Indian (n=4,410)	<0.001	0.879	0.854:0.905
Asian (n=3,354)	<0.001	0.899	0.87:0.929

4.4 Gender

The sample size used to evaluate whether gender is associated with utilization of preventive dental treatment includes 66,414 subjects. When evaluating the utilization of males and females, 53.7% of males received treatment, compared to 55.5% of females (Table 7).

Table 7. Utilization by Gender and Treatment Category

Gender	Treatment	No Treatment
Male (n=33,901)	53.7%	46.3%
Female (n=32,513)	55.5%	44.5%

Using a chi-square test, there is a statistically significant association between gender and utilization (p<.001). Although there is a statistically significant effect, it does not mean the clinical

effect is significant. This was determined by the relative risk, which calculates the strength of the association between the two variables. Females are 1.03 times (3%) more likely to utilize preventive dental treatment than males. Based on the confidence interval, the strength of the association is statistically significant (Table 8). However, 3% more likely is not very clinically significant.

Table 8. Descriptive Statistics of Utilization by Gender

P Value	Relative Risk	95% Confidence Interval
<0.001	1.034	1.019:1.048

5.0 Discussion

The utilization of dental care today, particularly by children of low-income families, is far below the recommendations of the ADA and AAPD (Yarbrough, Nasseh, & Vujicic, 2014). This study sought to evaluate the effect that specific patient characteristics have on the utilization of preventive dental services by Medicaid-enrolled children. These characteristics included patient age, race, gender, and basis of eligibility for Medicaid benefits (categorically needy or medically needy). Based on existing research, it was believed that utilization would be higher in females and white patients. A higher utilization rate was also anticipated with the six through nine year old age group and categorically needy children.

As predicted, females are more likely than males to utilize preventive dental services, however the significance is marginal. As reported in a study by Bouchery, females were more likely to receive preventive services, as well as treatment services (Bouchery, 2013).

Also as predicted, white children are more likely than children of other races to utilize preventive treatment. This is consistent with several studies that have concluded that racial minority children are less likely to receive dental treatment compared to Caucasian children. A study by Pourat suggests that the small number of participating dentists and a disproportionate number of dentists of racial minorities may contribute to the lower utilization rates of minorities of Medicaid enrolled children (Pourat & Finocchio, 2010). Savage also attributes the lower utilization rate of minorities to the idea that dental patients feel more comfortable with a provider that is the same race, and there are fewer practitioners from minorities than Caucasian practitioners (Savage, Lee, Kotch, & Vann Jr., 2004).

Three out of the five states analyzed were consistent with our hypothesis that medically needy children had a lower utilization than categorically needy children. Several studies have found similar results. Bouchery suggested that this could be related to providers requiring special training or equipment to provide care for special needs patients. Additionally, dental treatment may be given less attention in this population due to other health care needs that take priority (Bouchery, 2013). A study by Chi also suggested that parents or caregivers of children with special needs may receive inconsistent information from other health care providers about when dental visits should take place (Chi, Momany, Jones, & Damiano, 2011). In New York, however, medically needy children were more likely to receive preventive treatment than categorically needy children. This could be related to New York having a significantly larger sample size compared to a majority states. In Rhode Island, eligibility did not have a statistically significant effect on utilization. This could be attributed to Rhode Island having a significantly smaller sample size than a majority of states.

Consistent with our hypothesis, the six through nine year old age group was most likely to utilize preventive dental care in three of the five states analyzed (NH, RI, VT). Bouchery referenced the American Academy of Pediatrics(AAP) and the AAPD recommendation that children should see a dentist by age one (Bouchery, 2013). The study suggested that parents may not be made aware of this recommendation by health care providers, such as pediatricians. It also suggested that general dentists may not see children in this age group, which reduces the access that children have to providers. In New York and Pennsylvania, the age group most likely to utilize preventive dental services is the birth through two year olds. Contrary to the hypothesis, the six through nine year old age group was the least likely to receive treatment in both states. This is

likely due to the large sample size in these states compared to the population in most states in the US.

One strength of this study is that the sample size was not dependent on receiving responses from patients. Because the data was extracted from insurance company records, we can be sure that each child and the treatment they did or did not receive was accurately reported.

Many limitations to this study are present and could be improved. First, this study only analyzes data from five states for some of the variables. Therefore, it is not representative of Medicaid utilization overall. In future studies, it would be more accurate if more states and more regions of the country were included.

Secondly, the study's sample consists only of children who have been enrolled in Medicaid at least 90 continuous days. There is evidence that a large number of children experience gaps in Medicaid enrollment (Lee, Bouwens, Savage, & Vann, Jr., 2006). As a result, this study may underestimate the extent that dental services are underutilized by Medicaid-eligible children.

This study also does not include children with private dental insurance or no dental insurance. Including children with other or no dental insurance instead of only those with Medicaid would provide a more complete picture of utilization of dental care services in the United States.

Lastly, this study does not examine variables related to access to care, particularly dentist density or provider participation in Medicaid. These variables have been hypothesized to affect the utilization rate of different races or the special needs population.

Future research should look to eliminate these limitations by including more states and regions of the country, as well as analyzing data on a national level. In addition, it would be beneficial to include variables related to access to care, such as dentist density and urban versus rural populations.

6.0 Conclusion

The purpose of this thesis was to evaluate the extent to which the utilization of preventive dental services by children enrolled in Medicaid for 2016 in five northeastern states is affected by specific variables relating to patient demographics. In agreement with existing research, this study provides evidence that there is significant difference in utilization of preventive dental services between males and females. In addition, there is evidence that there is a significant difference in utilization rate between Caucasian children and other races. Contrary to previous research, the difference in utilization between eligibility status and patient age is conflicting and varies between states. The states with significantly larger populations result in outcomes that are opposite of those states with smaller populations. Future studies should seek to include more states and regions of the country, as well as additional patient demographic variables to gain more conclusive results.

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